What

have

I

done?

I have been sitting

in a lot of meetings.

The intention of this IDS program is to provide

- an extensive physical analysis of diffuse galactic gamma ray emission

- a continuously refined model of the diffuse emission to be used for foreground estimation by the GLAST team and GO's.

Topics:

- IC scattering and the interstellar radiation field.
- The distribution of gas in the Galaxy.
- Hadronic interactions
- CR-Propagation
- Statistics and implementation.

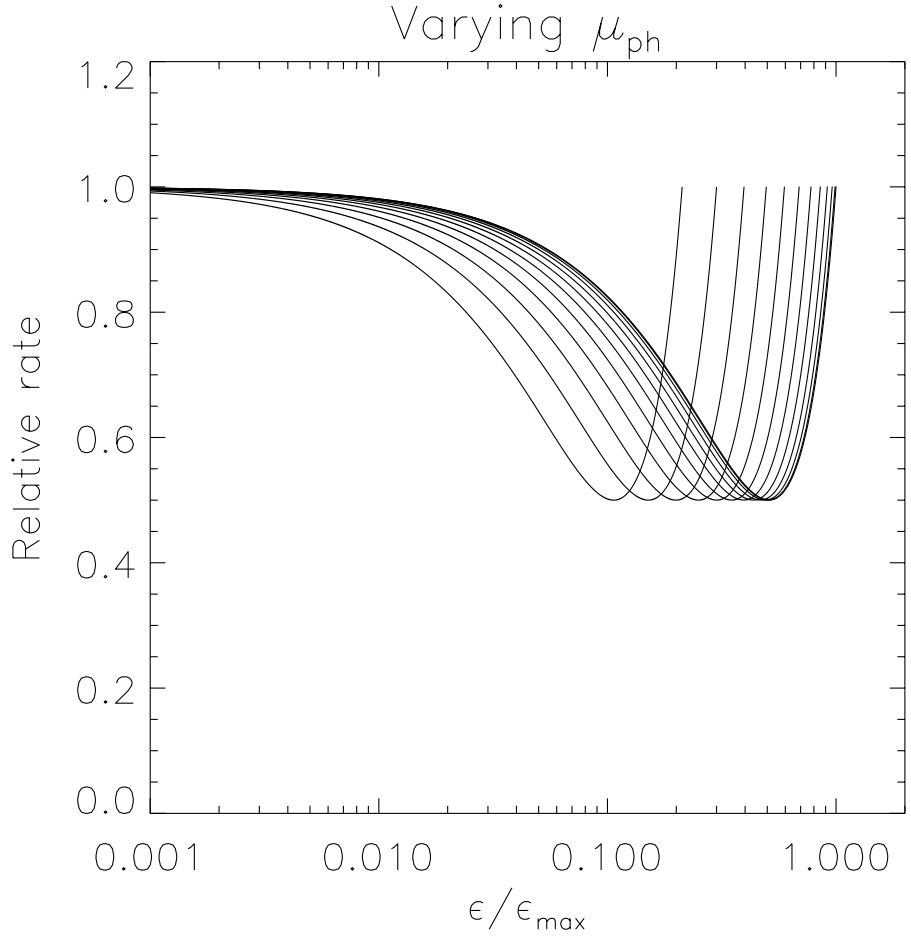
IC scattering and the ISRF

Collaboration with Ranga Chary (SIRTF data center, CalTech)

3D-model of the interstellar radiation field based on

- DIRBE emissivities.
- CO-dust correlation.

IC-scattering is anisotropic $\rightarrow$ sample angular distribution!



The distribution of gas

CO: A new complete CO survey is available (Dame et al.).

- $1/8^\circ$ sampling
- significantly improved sensitivity.

H*I*: Stray-light corrected surveys:

- Leiden-Dwingeloo survey with 38 arcmin resolution
- Argentina survey will be available soon.
- Canadian GP survey: high-resolution in parts of the GP.

H*II*: New model for n_e-distribution available (Cordes & Lazio)

Problems and open questions:

- Angular resolution of H*I* surveys
- Opacity on small scales.
- Vertical structure of the gas disk
- Separate radiative transfer for warm and cold gas?

Hadronic interactions

π^0-decay is not the only channel for γ-ray production

- Direct production of γ-rays
- Delta resonances at low energies
- Kaons, Lambdas and Sigmas at higher energies

Need to know

- the multiplicity spectrum
- the behaviour of higher nuclei

We use DPMJET v3 to derive the production matrices of all relevant secondaries.

The idea: the spectrum of particle i is a vector $N_i(E_{i,j})$.

$$Q_k(E_k) = \int dE \; \beta c \, N_i(E) \, \frac{d\sigma}{dE_k}(E)$$

$$\rightarrow \quad Q_k(E_{k,l}) = \delta E_j \, \beta_j c \, \frac{d\sigma}{dE_k}(E_{i,j}) \; N_i(E_{i,j}) = A_{k,i} \, N_i(E_{i,j})$$

CR-Propagation

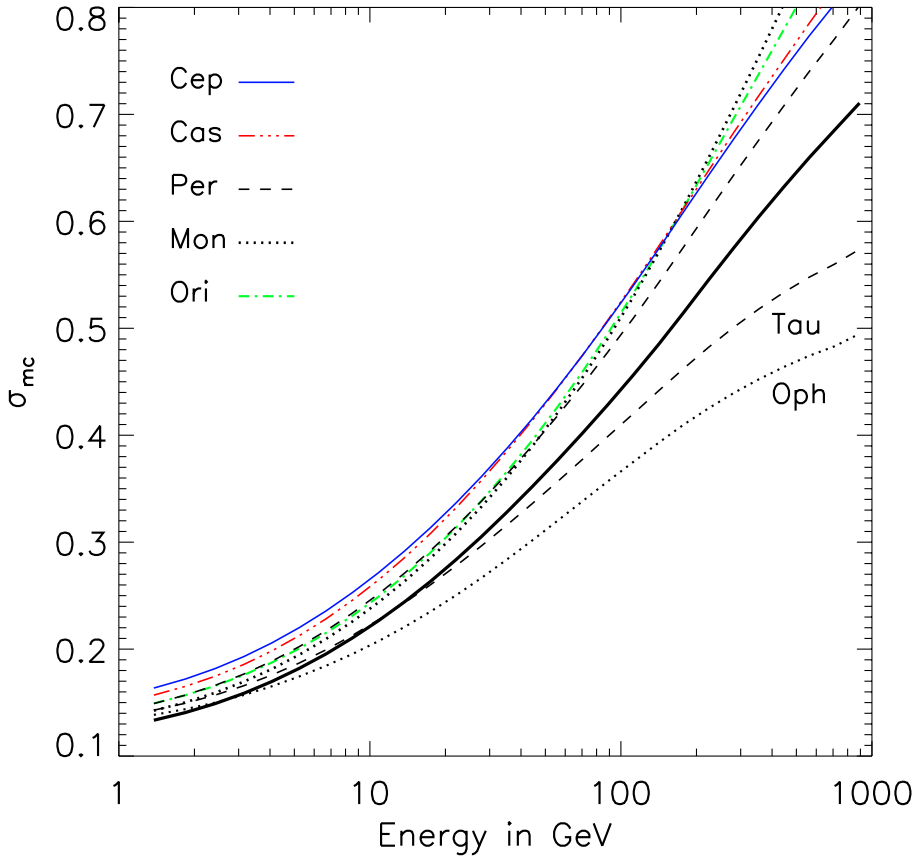
We continue the work on time-dependent propagation.

The correlation between electron spectra at different locations

$$\sigma_{\rm mc} = \sqrt{\frac{1}{N}\sum_{n=1}^{N}\left(\frac{F_{\rm mc} - < F_{\rm mc} >}{< F_{\rm mc} >} - \frac{F_{\odot} - < F_{\odot} >}{< F_{\odot} >}\right)^2}$$

For two fluctuating quantities:

$$< (\delta_1 - \delta_2)^2 > = < \delta_1^2 > + < \delta_2^2 > - < 2\delta_1\delta_2 >$$



Statistics and implementation

I wish

the LAT team would decide on binning in angle and energy.

Problem: Angular resolution

The H*I* surveys provide only $\sim 0.5^\circ$ resolution.

Inner Galaxy: $\sim 10^3$ photons/yr/halfdeg-pixel above 1 GeV!

Small-scale structure will be statistically significant.

How can we deal with it?

Problem: Systematics vs. statistics

The foreground model will be dominated by systematic uncertainties.

- We need a multiplier with a penalty function
- The penalty should depend on the angular scale

Need discussion with LAT-team on this issue.